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The Effect of Food Safety Training on the Knowledge, Behavior/ Attitude and Health of Fourth Graders and Their Parents

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ABSTRACT

THE EFFECT OF FOOD SAFETY TRAINING ON THE KNOWLEDGE, BEHAVIOR/ATTITUDE AND HEALTH OF FOURTH GRADERS AND THEIR PARENTS

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April, 2001

Education is an important part of a person's daily life. Basic, fundamental skills for daily living should be part of this education. At present, there is no consistent type of food safety training given to all students in the United States public school system. The aforementioned food safety training should involve the basic skills of personal hygiene: including hand-washing; understanding bacteria, their ability to multiply, and travel into our homes and our refrigerators; proper temperatures of food products; and safe steps of food-handling. These safe steps of food handling include: safe cooling procedures, safe thawing procedures, and proper washing of all items

purchased that are "ready to eat" or will receive no additional cooking.

Experts in the fields of education and health recommend that this type of education is important and may assist in the reduction of avoidable illness. People die each year as a result of foodborne illnesses. To assist in the reduction of illness and possibly death, sanitation or food handling education seems worthy and it makes sense for all populations.

This study analyzes the results of an implementation of a Food Safety Training Component for children. An instrument was developed to investigate the effect that such a training component would have on both the children taking the training themselves and for their parents in regard to the three dependent variables knowledge, behavior and attitude, and health.

With increased focus by the media on the area of food and food-related hospitalizations and death, it would seem prudent to provide our children with the basic skills and knowledge necessary so they may protect themselves. This study investigates the possible effects of a Food Safety Training Component on children and their parents.

Statement of Importance

Children of all ages should be taught about safe food handling and steps to avoid and minimize illness. The importance of this study is to examine the effect of food safety training on fourth graders and their parents.

Acknowledgments

I would like to give thanks and appreciation to my entire committee for all their guidance and leadership throughout my doctoral education. Dr. Cheryl Serrano, Dr. Richard Cohen, and Dr. Bernard Brucker have maintained the integrity and leadership necessary for me to complete a high quality work of which I can be proud.

Dedication

I would like to dedicate this work to my wife, Diana, who provided me with endless encouragement, support, assistance, and understanding throughout my studies. It is also with great relief to dedicate this work to my beautiful three daughters Samantha, Lauren, and Gabrielle. I look forward to spending more of my time with you all.

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The Problem

Introduction

At present, there is no permanent and consistent food safety training program implemented in public or private schools in the United States. Most educators agree it is important to inform and instruct children on proper food handling (USDA/FDA Education Initiative, 1998), yet no action has been taken to do so. The main benefit of teaching food safety would be the elimination of unnecessary risk and potential for foodborne disease that could lead to illness and/or death (Forman, 1998). Education in basic food handling procedures would equip students (and possibly parents) with the knowledge necessary to prepare safe and wholesome food products (USDA/FDA Education Initiative, 1998).

How Safe Food Handling Information Has Been Conveyed In The Past

In the prevention of foodborne illness, thus far, consumer education has been the primary strategy for educating the public at large (Schiffman, 1995). Studies have shown that consumers are receptive to information about microbiological hazards (Bruhn, 1997). Although consumers show interest, their knowledge about safe food handling is questionable (Bruhn, 1997). Not only does

knowledge need to be considered, but actual behavior and practice with foods should also be examined.

According to Williamson (1992), consumers under the age of 35 know less food safety terminology than those over 35 years of age. It was also noted that major food handling practices were either not known or understood in terms of cooking, cooling, re-heating, refrigeration, and washing between raw and uncooked food products. This demonstrates the need for consumers to understand the proper handling of certain high-risk food products.

One way safe food handling information is conveyed to consumers is by the use of a label on the actual food product. Distributors and packaging plants place labels on raw animal products warning of potential for illness if not handled properly or cooked to proper temperatures. These safety labels instructing consumers on safe food handling procedures can be attributed to the National Advisory Committee on Microbiological Criteria for Foods recommendation in 1989. The recommendations include: a mandatory uniform logo for perishable refrigerated foods, uniform labeling for frozen food, "use by" dates, and time/temperature indicators.

One might assume this effort on the part of distributors and packaging facilities would be enough to

inform the population about potentially hazardous food products.

> Communication of information is a two-way endeavor. In order for 'effective' communication to take place, the receiver of the intended message, in this case, the consumer, must be 'receptive' and pay attention to the message given. In the case of small labels placed on a package, written in a single-language (English), the probability of the message getting across to all that need it, is very small. (D.Siciliano, LD. Personal Communication, November 9, 2000)

Although food safety labels appear on many potentially hazardous U.S. products such as meat, fish, and poultry, the location, size of label, language used, and size of print is in question as to the realistic value and impact on consumers and their handling of these products.

Current Standards of And Opinions About Food Safety Training in US Public Schools

Knowledge of safe food preparation is fundamental and necessary for a healthy population. The challenge is that no consistent type of training in this area is given to children in U.S. schools (USDA/FDA Education Initiative, 1998). The development and implementation of a structured curriculum dealing with food safety is the process to

affect avoidable foodborne illness. "At present, the public school system is difficult to approach with any educational agenda different than their set curriculum" (Allison Strauch, Assistant Principle, Miami Gardens Elementary, Personal Communication, June 2, 2000). Teachers have limited to non-existent time available for additional curriculum. It is believed that teaching children food safety would ultimately take time away from other studies that are "in alignment" with the curriculum. However, if food safety were a part of the curriculum, then time for instruction would be allotted (Allison Strauch, Assistant Principle, Miami Gardens Elementary, Personal Communication, June 2, 2000).

The public health community agrees learning safe food-handling habits at an early age benefits health, both short-term and long-term, yet many children and teens have not received adequate education on the topic of food safety (USDA/FDA Education Initiative, 1998). The results of an informal 2001 survey indicated that education, specifically on food handling, whether elementary, middle, or high school is inconsistent throughout the country according to State Offices of Curriculum and Instruction at State Department Agencies.

According to an unidentified principal of an elementary school in a rural setting in South Florida, "It's not that we teach kids; it's a way of life. For example, after students finish with lunch, they are asked to wash their hands and the area where they just ate. And students who bring their own lunch are prompted to wash vegetables and fruits."

This action on the part of the teachers does reinforce that children should wash their hands before a meal, as well as, wash fruits and vegetables, but this is not training in food safety. A more explicit and thorough form of safe food handling or training should be taking place.

In a telephone survey conducted during the fall of 2000 to project specialists in Curriculum and Instruction Departments in every State Educational Agency across the Nation, few, if any, could specifically say "yes" food safety is taught to "all" children in their respective public school populations. Within the United States, Mississippi, Oklahoma, Maryland, Michigan, Delaware, and Utah included some form of food safety training for children in grades K-12. It should be noted that in most cases the available food safety instruction in these states is limited to specific "elective" classes, such as Home Economics offered at the secondary level. All other states

do not teach food safety or are uncertain food safety instruction is a part of the curriculum.

In the summer of 2000, the U.S. Food and Drug Administration presented a new National Campaign about cooking foods to proper temperatures and using a thermometer to check if foods are cooked to the safe temperature called the "Thermie" Campaign. The campaign selected a cartoon version of a thermometer to emphasize the use of the instrument. If someone contacts the FDA's public web site they can obtain the information. Those who do not search for this type of information miss it. This strategy is irregular, inconsistent, and does not meet the objectives identified in the Food Safety Initiative which was signed in a "memorandum of understanding" forming the public/private Partnership for Food Safety Education. The Partnership members include the Food and Drug Administration (FDA), Center For Disease Control (CDC), the United States Department of Agriculture (USDA), industry, consumer groups, and the U.S. Department of Education (Hingley, 1997). The main goal of this Initiative was to launch a nationwide food education campaign for the general public. Additionally, multilingual programs that promote food safety for the food service industry was also a focus area for improved "understanding".

The Ideal Setting For Educating American Children on Food Safety

A recent government study confirmed that food safety education is an important subject area that could be integrated as a component of science-related classes (USDA/FDA Education Initiative, 1998). Although the study suggests the middle grades (5-8) offer the best opportunities to integrate food safety education into the curriculum (p. 57), many of the interviewees (master teachers, school staff, and experts on curriculum development) suggest starting as early as third or fourth grade. This study (1998) recommends a cyclical curriculum that teaches children some food safety basics in elementary grades, builds upon prior knowledge developed in the seventh grade, and reviews curriculum in the tenth grade. This spiraling curriculum would promote continued development of the knowledge and behavior that promote healthy lifestyles and reduce illness. Many American children in the fourth grade and older are "latch-key" kids (children who get home from school while parents are still at work), the training has both short and long-term benefit, as these children might be preparing food for consumption without adult supervision. The Child Welfare League of America (1998) reports that forty-two percent of

children between the age of five and nine are sometimes home alone. For children ten years and older, the number of children home without parental supervision during after school hours is seventy-seven percent (Carter & Carter, 1998).

Science-related classes are suggested by the Education Initiative because this would assist the children in understanding the biological aspects of food handling and preparation. This corresponds with the standards for science that were developed by the National Research Council (1997). The standards were developed by educators from around the Nation and published in the National Science Education Standards (NSES, 1997). These standards specify concepts that children should be exposed to and learn in grades K-12. For example, the NSES states:

> By middle school, students begin to realize that illness can be caused by various factors, such as microorganisms, genetic predisposition, malfunctioning of organs and organ-systems, health habits, and environmental conditions…One very important issue for teachers in grades 5-8 is overcoming students' perceptions that most factors related to health are beyond their control. Developing a scientific understanding of

health is the focus of this standard (USDA/FDA Initiative, 1998 p.17).

The Sample Group For The Present Study On Food Safety Training & Children

For a study such as this, it would be impossible to test all children in all U.S. schools on food safety knowledge, behavior, and attitude. For the purpose of this study, based on the USDA/FDA Education Initiative recommendation, fourth graders were the population analyzed. A total of fifty-two fourth graders at four public park and recreation department after-school care facilities were used for the study. All fourth graders were from a depressed socioeconomic urban area of the South Florida. This particular population sample was chosen based upon the ability to access the desired age population group. Broadening the sample would have been difficult to manage and could have lead to a financial constraint.

This study focused on the following variables: food safety-related knowledge, behavior, and attitude. The instrument included a questionnaire concerning student and parent health status. The questionnaire was used to determine a health score in relation to food, food handling, and food safety knowledge. The health score was used to determine any impact the training had on health for

both students and parents. The Food Safety Training Component was one hour per training day over four consecutive weeks.

The major challenge of any such initiative is changing the behavior of the parents as well as the children. The Center for Injury Prevention used children as the catalyst for behavioral change in parents with their "Buckle Bear" study (BuckleBear Educational Materials, 1982). The Buckle Bear study used a cartoon version of a bear wearing a seatbelt to teach children to wear their seatbelts. The Center for Injury Prevention realized an expected outcome by teaching children to wear seatbelts, and the parents followed suit.

In the Sun Smart Curriculum Study (Small-Johnson, 1998), a study about reducing sun exposure for children and skin cancer prevention, parents received a written survey instrument at home to measure parent knowledge, attitude, and behavior. This training affected the children, but was less effective at changing the outcome among the parents. This study recommended increased parental involvement for the purpose of changing parental behavior. This research supports the decision to include the results of the questionnaire completed by parents in the study.

The skills the children were presented involved food handling where contamination or bacteria growth may occur. For the present study on food safety training, information the children learned in the Food Safety Training Component was opposite to parental contact in the home. It was assumed that the children would intervene, offer, or recommend new information from the Food Safety Component while watching their parents in the process of food handling and preparation. It was anticipated that the parental/children involvement would result in an increase post-test scores of the parents.

Students and parents/guardians were used in this study because the students have day-to-day contact and interaction with their parents, and it was assumed that the children have a better opportunity to influence their parents' behavior than do outsiders (Small-Johnson, 1998). It was also thought that through interaction with their children, the parents and family members might demonstrate positive change at a more significant level than compared to an unfamiliar source. The studies on seatbelt and sun block utilized parents and their children to affect change (Buckle Bear Educational Materials, 1982) and (Small-Johnson, 1998).

The Study

More Short-Term and Long-Term Benefits of Food Safety Education

Food-related illness occurs in this country and others (Mead, Slutsker, Dietz, McCaig, Bresee, Shapiro, Griffen, & Tauxe, 1999). The challenge is with the education and the transfer of knowledge to those handling food products for themselves and/or for others. Eliminating illness, therefore, is the main goal of this type of education. The subject of foodborne illness and food safety education may affect all school children, their siblings, parents, relatives, neighbors, teachers, and any other people with whom they come in contact. Foodborne illness does not discriminate nor avoid specific groups of people. Any individual is susceptible.

A Sanitation Instructor and Dietician at Johnson & Wales University states, "Less (or no) illness could increase student attendance, grade point average, as well as reduce medical expenses and parents' time away from work." (D.Siciliano, LD. Personal communication, November 9, 2000). People of all ages become sick from food that has been mishandled both in restaurants and in the home. Teaching some basic skills that will assist in the reduction of such illness makes sense and is extremely beneficial and practical. More importantly, would this

type of information promote knowledge and safer food handling practices in the families if the students receive the training? If so, the training makes even more sense for the estimated "real value" this research initiative represents.

According to an On-line site, KidSource.com, "Whether selecting a family car, deciding where to live or just choosing what to watch on TV, parents everywhere tend to share the same credo: "Nothing's too good for my kids." Ensuring the safety and wholesomeness of foods for infants and children is no exception." This becomes an issue; people agree with the importance and the need, yet educational provisions are not mandated throughout the Nation or the world.

The purpose for this type of instruction was to teach the students and their families about the safe steps of handling food products. Although not instructed to do so, an expected outcome was that children involved in the study might have discussed what they learned in the Food Safety Component with their parents. Through discussion, demonstration, and informational handouts, it was thought that the students might have informed the parents in proper procedures as a result of the training. Hopefully, the utilization of proper food handling procedures by parents

(or caregivers) and children will result in safer foods for consumption. It follows that safe food will result in less food-related illness.

The assumption was that knowledge would increase for both students and parents in terms of safe food handling procedures. As a consequence, a behavioral and attitudinal change would also take place in terms of safe food handling. The research supports the notion that training children in food safety would result in an increase of knowledge, skills, and positive attitudes. According to a cognitive/behavioral psychologist: "In order to make a long-term positive change, it starts with the manner in which one thinks/behaves that will cause a change in emotions. It is a reciprocal relationship between thoughts, feelings and behaviors" (Dr. S. Mendelson-Personal communication, November 6, 2000).

In a recent study of behaviors associated with foodborne diseases, Yang, Leff, McTague, Horvath, Thompson, Murayi, Boeselager, Melnik, Gildemaster, Ridings, Altekruse, & Angulo (1998) described that strategies aimed at reducing food-related illness should reduce the prevalence of behaviors associated with foodborne diseases, increase consumers' awareness of risks from foodborne illness, and motivate them to change high risk behavior.

Therefore, education in food safety may assist in knowledge and may also assist in how one thinks or behaves with or towards food products and preparation.

Variables That Affect Food Safety Behavior in Adults

Factors that may influence a person's behavior and/or attitude toward food safety include the following: age, educational background, household income, the presence of children in the household, household vegetable consumption behaviors, and trust in the food system (Jussaume & Higgins, 1998).

It has also been found that certain high-risk food handling, preparation, and consumption behaviors were more common in specific population groups. For example, men consume more "pink" hamburgers than do women, and white Americans have a higher "pink" hamburger consumption than any other race. Additionally, the prevalence of these high-risk behaviors associated with foodborne diseases decreased with age, increased with education and increased with yearly salary (Yang et al. 1998). This afore-referenced study identified characteristics associated with behavior in people and food related high risk activity.

Studies suggest that even some highly educated people might not know or choose to ignore the hazards associated with food handling behaviors that have been related to

foodborne diseases (Yang et al., 1998). Despite knowing the hazards associated with high-risk behaviors, highly educated people might continue to perform such behaviors due to cultural influences or social norms. Decisions about behavior frequently are guided by risk perception rather than risk awareness. Factors that can influence risk perception include: media coverage, opinions of scientific experts and peer groups, perceived control over risk, and knowledge about a potential hazard (Yang et al., 1998).

The Ideal Population to Show The Most Probable/Possible Behavior Change In Adults

For a study, such as this, on food safety training and children, research (1998) indicates that it would be advantageous for the sample "parents" to be from an older, white, well-educated, and high annual salary population that has little contact with media coverage. Such a population would be the most in need of food safety training (Yang et al., 1998) and might show the most positive results from such an initiative. Without unlimited resources and access to a large enough sample, this type of study would be difficult to implement. Therefore, for the purpose of this study, parents were from a low socioeconomic, rural area in South Florida.

The Significance of a Study on Food Safety Training And Children

The significance of this study and it's ability to support that food safety education is the easiest way to assist in the elimination of illness for all concerned is of value to children, families, educators, the medical field, health insurance agencies, and politicians. In all, knowledge in the area of food safety should be viewed as a significant core value for Americans. Such knowledge may determine life and death in some instances. It is a fact that between five thousand (King, Black, Doyle, & Fritsche, 2000) and nine thousand (Bennet, Holmberg, Rogers, & Solomon, 1987) people die in the United States every year because of some preventable food-related illness. The death toll is small compared to cancer, heart attacks, or automobile accidents. The noteworthy difference is that many of these deaths due to foodborne illness are for the most part preventable.

Preventing unnecessary illness from mishandled food is critical. Importance may fall on the side of the person who falls victim of such illness, or the loved ones of the victim. For the purpose of this research study, the premise is that all Americans are potential victims of a foodborne illness outbreak.

This research intended to provide a step toward some form of education initiative for school-age population. In terms of existing knowledge, it is well known that people of all ages get sick and die needlessly due to improperly handled foods (Fly & Gallahue, 1999), yet the aforementioned initiative is lacking. Perhaps this research will provide a basis that will lead to other research studies investigating food safety training and its affects on children and other family members.

The worthiness of this research is in development and acquisition of basic food safety information that all people should have and understand. For example, common bacteria have been able to survive extreme conditions and some bacteria are so resistant to antibiotics that they can kill (Spake, 1999). Old and new emerging pathogens may cause serious health problems (ServSafe, 1999); therefore, food safety education is the way to counter this and is in the best interest of all global citizens.

This research utilizes an implemented training component that is replicable. It is only one of many training approaches that could be undertaken. For example, (a) Parent/child classes could be offered in community programs with emphasis on food safety and hygiene; (b) after-school seminars or workshops could afford parents the

opportunity to learn more about safe food handling; and (c) most children have to take some form of physical education class that could include a component on personal hygiene and food handling. The only dilemma that remains in most scenarios is the ability to disseminate information on food safety topics to all students and their families. By focusing on this problem, and its method of delivery, it is hopeful that solutions will emerge from the research and effect the health of our global citizens.

Other Practical Uses of a Study on Food Safety Education and Children

Education practitioners may use this research as a reference to the information, delivery, and exchange of food safety-related knowledge for children and parents. The practicality of food safety education lies in the ability of an educator to make a difference in the knowledge, attitude, and behavior of the students. This education should be in a form the students will understand and remember easily with health-related skills and information in relation to food and food-handling procedures.

Professional peers in education and training may use this research as a representation of the ability to effect not only the student's knowledge and behavior, but to also

have some impact on the knowledge and behavior of those people in close proximity to that student (Small-Johnson, 1998). This medium of information transfer, from child to parent, could be used in other initiatives from drug use to racism. The potential for training is unlimited. The idea is to use the student as a medium for information transfer to the parent, in addition to, individual learning. This transfer of knowledge may occur informally at the dinner table or in the kitchen during food preparation, and could positively effect the way parents handle and prepare certain (high-risk) food products. The ability of the children to discuss the learned information with their parents is the exchange/catalyst that will impact knowledge, attitude, behavior, and health (Small-Johnson, 1998).

In terms of how this research will effect public and private education, one can only surmise that food safety and sanitation may be viewed as a vital and necessary component to integrate across the curriculum and grade levels. Perhaps, this could lead to an associate degree program in Foodservice Sanitation. The entire food service industry demands attention in this area of operation. A united effort to eliminate foodborne illness could bring attention to institutions such as local educational

agencies and other institutions of higher education that already have such educational programs in place. Graduates with a degree in Food Safety have the potential to be highly recruited for employment in any establishment that serves food products, especially large chains of restaurant, hotel, and cruise ship companies.

Definition of Terms

Cross Contamination: The transfer of harmful substances or disease-causing microorganisms from one food product to another through direct contact with utensils, equipment, work surfaces, or employees' hands or clothing.

Foodborne: When food is the medium for bacteria growth or transfer of bacteria

Food Safety: Practicing the safe handling of food products in regard to hygiene, storage, refrigeration, handling, thawing, cooking, cooling, and re-heating.

Food Safety Training Component: Food safety training one hour per training day over four consecutive weeks. Training objectives included: (1) clean and wash fruits, vegetables, and hands, (2) preventing cross-contamination (3) cooking to the correct temperatures, and (4) cooling and thawing properly.

Pathogens: Microorganisms that can cause disease in living organisms.

Salmonellosis: A foodborne illness (infection) commonly found in poultry products.

Sanitation: Following safe guidelines in the handling, preparation, and serving of food products and to maintain a clean and sanitary environment for the purpose of food preparation.

Chapter Two

Review of the Literature

Issues on Food Safety

As the population increases, so does the occurrence of foodborne illness. More and more people are finding themselves afflicted by some form of illness that is due primarily to mishandled or contaminated food, whether conscious or unconscious. The increase in handling of food from the field to the table ultimately increases the likelihood of contamination (ServSafe, 1999). In the United States alone, foodborne diseases are estimated to cause 76 million cases of illness, with 325,000 hospitalizations, and at least 5,000 deaths/year (Mead et al., 1999). World wide it was estimated in 1998 that 2.2 million deaths were associated with diarrhea and overall 1.5 billion cases of diarrhea occur annually in children under 5 years of age (WHO, 1999).

The reasons for a foodborne illness vary. In underdeveloped countries, poverty, poor water, contaminated foods, poor hygiene practices, under-education, and contact with animals and flies add to the problem of food-related illness (King, J.C., Black, R.E., Doyle, M.P., Fritsche, K.L, 2000). In general, people have very little or no food safety training. It becomes crucial that proper handling of

food products be taken seriously, especially when dealing with the sick, elderly, pregnant women, and children (ServSafe, 1999). When immune systems are deficient, or underdeveloped, as is the case in children or the elderly, the potency of food-born illnesses becomes extremely dangerous and even deadly. The importance of this issue is critical to the health of our children and our population in general. Herein lies the critical need for an analysis of children and food safety education.

Food safety is taught in culinary and hospitality schools, but is limited in other institutions of higher education. Food safety training is very limited in middle and high schools other than that which might be covered in a Home Economics class (Allison Strauch, Assistant Principle-Personal communication, June 2000). It can be argued that food safety issues should be dealt with in the home. However, some children would receive and process the information while others would miss it.

All human beings must eat, and at one time or another every human being will be required to prepare some form of food product either for themselves or for others. It is at this point that an understanding of food handling becomes crucial. Not only do people need to understand the techniques, but also, when to apply the techniques.

Outbreaks of salmonellosis have been associated with fresh watermelon as well as fresh cantaloupes (Mohle, Reporter, Werner, Abbott, Farrar, Waterman, & Vugia, 1999). Consumers of fresh fruit should wash melons of all kinds before cutting them. Would the average consumer know to wash melons before cutting and serving to a child (or anyone for that matter)?

Food Safety as A Global Issue

The International Conference on Nutrition, held in Rome in 1992, adopted the World Declaration and Plan of Action for Nutrition. The plan called on governments and other concerned parties to "adopt" and strengthen comprehensive measures to cover and control food quality and safety with a view of protecting the health of consumers. The World Health Organization (WHO) is an active member in promoting consumer health and nutrition initiatives. The WHO is part of the United Nation's large-scale initiative to promote health. At present, their main areas of activity include Policy Development, Food Safety Assurance, Promoting Food Safety, Training and Education, Street Food, Tourism and Safe Food, and Information Dissemination. The World Health Organization states:

> Every country needs an effective food safety programme in order to protect the health of the Nation and to

participate in international trade of food. Trade is an important stimulus to a country's economic development and in the current global economy, it is not possible for any one country to remain isolated from changing demands of international requirements for food safety regulations. (p.3)

The Need for Food Safety Education in the United States and Other Countries

CT Foreman, Coordinator of the Safe Food Coalition (1998) also feels strongly about the need for consumer education and awareness. In her testimony, she states:

> The National Academy of Sciences documented that, in short of the President of the United States, no one person is really in charge of the safety of the Nation's food supply. Today, food-safety responsibilities are spread between numerous Federal agencies with conflicting missions and responsibilities, resulting in uneven coverage and enforcement, according to the Academy. (Safe Food Testimony, 2000, p.1)

This important worldwide issue is factual and real. The question in need of an answer, then, is "How can educational initiatives become part of an agency's responsibility?" In 1998, in the USDA/FDA Education

Initiative: Evaluating the Placement of Food Safety Education in American Schools Report, it clearly states importance. "There is a consensus in the public health community that learning safe food-handling habits at an early age benefits health in the short and long term, and yet many children and teens have not received adequate education on the topic of food safety" (p.1). The study makes a number of recommendations. Some are the following: (a) "It would be best to start them with something simple in fourth grade, and then reinforce the message in seventh grade and again during their sophomore year" (School Health Service Personnel), (b) Promote the importance of food safety issues at various organizational levels—regional and State mandates and curriculum frameworks; schools district curriculum supervisors; and individual classroom teachers, and (c) Use family or consumer science classes as the setting for food safety education. In terms of reaching the most students, science seems to offer the most promise.

In the Healthy People 2000 and 2010 National Heath Promotion and Disease Prevention Objective, the U.S. Department of Health and Human Services include "healthy behavior goals" (p.20), which coincide with education benefits on food safety. They include the reduction of foodborne illnesses and reducing salmonella infections

among others. Here, a department of the United States makes a goal, yet the introduction of such education for children is not yet evident in the curriculum.

In the USDA/FDA (1998) study, one consumer scientist stated, "The way you can tell if a subject is interesting to children is if they go home and tell their parents about it. I have found that food safety really is of interest to students. They do go home and tell their parents about it" (p.41). If a student is expressing interest, and their parents are aware of this interest and the importance of the issue, it becomes clear that education in some form needs to be implemented in order to affect the behavioral patterns of the students, their family members, and their parents.

As for education and training in other countries, a dilemma remains. Safe water and basic educational needs first must be met. If training in this field is to occur, concepts such as hygiene, temperature, sanitation, and cleaning should be introduced first. The lack of potable water will be an issue for many of those living in rural areas or underdeveloped countries (Environmental Matters, 1997). If full-scale education classes are difficult to implement, perhaps a country could introduce a food safety day.

In April 1996, the Adams County Extention and local fire fighters promoted a "Kids Safety Day" (Gallmeyer, 1997). Over 500 children participated and learned about issues from food safety to farm and lawn equipment safety. This approach could be an alternative for those areas or countries that may have problems with getting the training into the school system. This would also be a means "to get the message out" to home-schooled children and children in rural areas of the country.

The Partnership for Food Safety Education (1998) made up of the United States Department of Agriculture, the Center for Disease Control, the Food and Drug Administration, and Industry recommends divides (home) food safety into four critical categories. These include (a) clean and wash, (b) prevent cross-contamination, (c) cook correctly, and (d) refrigerate promptly.

Studies have also informed us on the knowledge base of consumers. Societal changes, including changes in family structure, increases in convenience foods, and a decline in the extent of training in proper food handling are factors responsible for inadequate food safety knowledge and practices (Knabel, 1995). What someone does not know may hurt him or her and/or others. It is unfortunate, but microbiological food safety education for consumers is made

up of only a few recommendations and guidelines (Schiffman, 1995) and these are vague. Combine ignorance with cultural behavior and the resulting awareness remains minimal at best.

The most serious findings by Knabel (1995) were associated with the proper refrigeration of food products after cooking. Other research showed that only fifty-four percent would, correctly, wash a cutting board with soap and water after chopping raw meat and before cutting fresh vegetables for a salad (as cited in Fly & Gallahue, 1999). Fly & Gallahue suggested integrating food safety concepts into physical education curricula. It was also mentioned that "Williamson and his associates did not study children, but did determine that younger adults were the least knowledgeable and recommended that food safety education programs be directed to young consumers" (Fly & Gallahue, 1999, p.3).

In a thesis from Southeast Wales it is stated that "education needs to be combined with legislation in an attempt to reduce the incidence of food poisoning" (Mullan, 1997 p.2). In a developed country across the Atlantic, it is interesting to note that the same problem exists with similar remedies. From developers of food safety education it has been stated:

> Awareness has gone up. But there is sort of a dichotomy. It's the highest it's been. So now we know, but we still don't change our behavior. We know so much about food safety, but we leave things out on the counter, don't wash our hands. We know we're supposed to but we don't. Awareness is raised, but our behavior hasn't changed. (USDA/FDA Initiative, 1998, p.29)

How Food Becomes A Health Hazard

For the most part, foods become contaminated through temperature abuse and by "cross- contamination" the transfer of harmful substances or disease-causing microorganisms from one food product to another through direct contact with utensils, equipment, work surfaces, or employees' hands or clothing (ServSafe, 1999, p.g-4). Prevention of foodborne disease depends on good hygienic practice by all food workers as well as adequate temperature, control during cooking, preparation, and storage, to prevent incubation and multiplication of organisms (Penman, Webb, Woernle, & Currier, 1996). Food-handling procedures should be reviewed to minimize direct contact with foods after cooking or with foods that are eaten without being cooked (Hedberg, White, Johnson, Edmonson, Soler, Korlath, Theurer, MacDonald, & Osterholm,

1991). Simply by educating people (and children) as to these important topics, the number of cases of domestic food-born illness may be drastically reduced.

Foreman (1998) cites some preventable "Imported" food-related problems that should be analyzed. Since 1990, fourteen foodborne outbreaks linked to imported foods (not including meat and poultry products) have been discovered. The following products were involved: cantaloupe, crab meat, coconut milk, tuna, scallions, alfalfa sprouts, raspberries, cheese, strawberries, blue marlin, and a seafood product called limpets. The countries of origin included Ecuador, Mexico, Thailand, Portugal, Israel, The Netherlands, and Guatemala (p.2). The main problem with most of these outbreaks, as well as those involving meat and poultry, is that the problems are not discovered until after the foods have been distributed throughout the United States. The result is hundreds of preventable food-related illnesses.

Outside the United States, the main problem for people is their ability to obtain safe potable water. In areas such as the Caribbean, South America, Africa, and the Middle East, safe water can be difficult to secure, therefore, increasing the possibilities for illness. An

intensive sanitation project in Vietnam took a broad approach with objectives of:

> Reducing waterborne diseases (through sanitation education and low-cost sanitation facilities); to raise awareness (of personal and food hygiene, safe water, solid and liquid waste disposal, disease transmission, and the relationship of the UNICEF workshop to health); to create a safer environment for better living through a package of sanitation measures; to introduce low-cost appropriate technology; to develop a methodology and strategy to make the project self-sustaining and self-expanding; and to involve the community (Global Environmental Initiative, 1998, p.1).

As one can imagine, the amount of time, energy, and resources can be extreme. No matter the consequence to the people of the area, if the community was not part of the initiative commitment, improvement was low.

As outlined by ServSafe (1999), the coursebook on food safety by the National Restaurant Association, the greatest dangers to food safety are foodborne illnesses. *A foodborne illness is defined as a disease that is carried or transmitted to people by food.* Stephen J. Caldeira, the President of the National Restaurant Association's

Educational Foundation, states "food safety is non-negotiable" (1999, Forward).

It should be a given that the foods bought and consumed should be safe for people, especially those high at risk. It is true that anyone can contract a foodborne illness, but some people are more "at-risk". According to the National Restaurant Associations ServSafe sanitation course book (1999) this group of high-risk individuals would include: Infants and young children, pregnant women, elderly people, people taking certain medications, such as antibiotics and immunosuppressants, and people with weakened immune systems.

In a bulletin from the World Health Organization, (Kaferstein and Abdussalam, 1999) it states:

> As the population increases in the world so does the necessity to inform all people as to safe food handling procedures. In Industrialized countries the proportion of people over the age of sixty is predicted to rise from seventeen to twenty-five percent by 2025. Such change is likely to lead to acute socioeconomic problems and the emergence of many people with reduced resistance to disease, including foodborne diseases. (p.2)

Although any food product could become contaminated, the ServSafe (1999) book groups the following as potentially hazardous foods (phf's):

> Milk or milk products, shelled eggs, meats, poultry, fish, shellfish and edible crustacea, baked or boiled potatoes, tofu or other soy-protein foods, garlic-and-oil mixtures, plant foods which have been reheated, raw seeds and sprouts, sliced melon, and synthetic ingredients. (p.1-6)

It becomes evident that education in the prevention of foodborne illness needs to be available not only to the participants, but their surroundings should also assist in the facilitation of this education and support any initiative that would benefit health. If a family or community acknowledges the need and assists/supports in the learning, students will grasp the importance of the issue and carry it on in their lives, thus sharing their knowledge with whom they come in contact.

The Best Way to Teach Safe Food Handling

In order to teach and effect the students' knowledge, behavior/attitude and health activities and/or participation is crucial. It has been found that the most effective format for learning to take place may incorporate simulations that incorporate both the symbols helpful for

generalization and the actions useful for application (Cohen & Bradley, 1977). It is therefore necessary for the trainers to make the learning process for each class a participating/experiential application of the learned Food Safety component. Through this form of delivery, it is believed an effective and dramatic form of learning and transfer of knowledge gained will take place for the students and their parents.

Purpose

The purpose of this study was to investigate the ability of a Food Safety Training Component to increase awareness of safe food handling. Further, the purpose was to determine the effect of food safety education on children and parents in terms of knowledge and application.

The public school system in the United States is an appropriate place for a food safety education intervention. It makes sense and is feasible for delivery. In this study, the research took place at Public Park and recreation department after-school cares facilities. Public schools were not used because of lengthy permission procedures from school boards, formal application processes, and other obstacles that would have complicated the study. The study results potentially can be used to influence local and State educational agencies to take

initiative toward integrating this type of education in all schools.

Food safety and "safe" food handling procedures are basic and fundamental for the well being of individual and family health. It is also in line with the National Environmental Health Association Position on Children's Environmental Health adopted July 2, 1997. The association's recommended action points (5 and 6) are clear. #5: Provide parents with the basic information so they can take individual responsibility for protecting their children from environmental health threats in their homes, schools, and communities. #6: Expand educational efforts with health and environmental professionals to identify, prevent, and reduce environmental health threats to children.

The possible implications include a reduction of foodborne illness, death, medical expenses, absences that could impact grades, and a more informed society. Most food poisoning goes unreported according to the U.S. Food and Drug Administration. Consumer awareness for both adolescents and adults could increase the reporting of food-related illness allowing health officials and government agencies to remedy high-risk activity, and potentially reduce the number of outbreaks.

Research Questions For the Present Study

Research questions for this study include the following:

1. Does a Food Safety Training Component for children significantly improve their knowledge of safe food handling?
2. Does a Food Safety Training Component for children significantly improve their behavior/attitude of safe food handling?
3. Does a Food Safety Training Component for children significantly improve their health score?
4. Does a Food Safety Training Component for children significantly improve knowledge of safe food handling in their parents?
5. Does a Food Safety Training Component for children significantly improve their parents' behavior/attitude of safe food handling?
6. Does a Food Safety Training Component for children significantly improve their parents health score?

Chapter Three

Methodology

Methodology Design

The methodology design for this study is experimental. The rationale is related to changing (increasing) knowledge and attitude/behavior in terms of food handling and preparation in the home. For the study, because of time, location, and financial constraints, the setting was at after-school programs offered at Park and Recreation facilities in a low socioeconomic, urban area of the Southeast United States.

Research has indicated that the higher the education and socioeconomic class, the more prone a group is to display high-risk activity in terms of food handling and eating habits (Yang et al., 1998). This population was unavailable for the purpose of this study.

Subjects

The subjects for this study consisted of fifty-two children from four different After-School Programs at public park and recreation facilities and forty-two parents that agreed to participate. All fourth grade students that attended the facility had the ability and consent to participate. Parents agreed to participate and signed a consent form (Appendix B) for the child to attend the Food

Safety Training Component. The reason for this sample was their age, availability, the facilities receptive response to this form of instruction, the ability to complete the four-week Food Safety Training Component, and the outcomes in terms of health for children. Classes only included nine and ten year-olds with a mean age of 9.486 and a standard error of .083303 for the Food Safety Training Component. Children and parents are all from a depressed urban area in the South Florida. Both children and parents were predominantly Hispanic and Black.

Instrument

In previous research (Mullan, 1997), descriptive data and an open-ended statement were used. For the purpose of this research, data in a parametric format was preferred. A standardized instrument for this type of research had not been developed with validity and reliability. Therefore, an empirical test with face validity in parametric format was developed. Designed to measure knowledge, attitude/behavior, and health, this instrument consisted of short questions based on the materials covered in a pilot study on food safety training during the summer of 2000.

The test was constructed by a panel of experts in the field of Food Safety and Sanitation at a University in

south Florida. The panel members were surveyed and asked to develop questions they believed were important to ask people in order to understand their knowledge, attitude and behavior, and health in terms of food preparation and handling. A total of one hundred and twelve questions were collected from the panel on Food Safety and Sanitation. The questions were analyzed for content and clarity. Duplicate or similar questions were collapsed into a single effective question. Many questions were very similar which increased the face validity of the final test. All questions were in a multiple-choice format. There was one correct answer out of four that provided answers for forty of the questions. Four questions had two possible answers (yes & no), two questions had three possible answers and four questions had five possible answers. One test with a total of fifty questions was used; the first thirty were for the knowledge part of the test, followed by ten for the behavior/attitude test, and ten for the health test.

To increase the validity by reducing content confusion, a group of five parents were asked to complete the test with a proctor present. Parents were instructed to ask for any clarification necessary on the test questions given. On the basis of their response, minor revisions were made to the test and some questions were

eliminated from the instrument. The questions were in multiple-choice format, dealing mainly with thermometer use, hand washing, food storage, and preparation methods in the home (see test in Appendix C).

Procedure

The 1998 Education Initiative (1998) recommends food-related training take place in the fourth, seventh, and tenth grades. Overall, the training would build upon past student knowledge (hand washing, cooking temperatures, cooling methods, and safe handling) to reinforce safe procedures and practices.

Data collection took place at the four Park and Recreation facilities by the Food Safety Training Component instructors for all the children on the first day of class. The children brought the parent consent form and the completed parent pre-test on the first day of class. Parents received the test via the park and recreation facility. A plain manila envelope included the parent consent form, the test, answer sheet, and a pencil. Instructions were minimal and included a request for the children to return the packet on the first day of class.

Post-tests for the children were administered on the last day of class. Instructions for the post-tests were identical at all four parks and were administered in the

same way as the pre-test for consistency. The Food Safety Training Instructor collected all tests and answer sheets for the children. Two weeks later, parents were given the post-test to complete. In an envelope, the surveys, answer sheets and thank you letters were distributed to the parents via the Park and Recreation facility. The instructors who administered the Food Safety Training Component collected the post-tests.

Fifty-two children were given the pre-test and thirty-seven children were given the post-test. Parental response for the study resulted in forty-two pretests and twenty post-tests. The reason for the reduction in pre to post test numbers includes a drop-out rate of more than thirty percent at three of the four parks. Reportedly, the children thought the tests were long and did not care to take tests once out of school for the day. As for the parents, park employees stated the parents just thought it was too long and a waste of their time, they "already took it once!" Future research may consider developing a shorter instrument and a method of informing the parents about the importance of taking the test twice. This was explained in the parent consent form used although it can not be assumed the parents read or understood it fully. As for the children not wanting to "work" any more once out of

school, possibly this form of education in the school setting would eliminate the students negative approach to the test taking.

The Food Safety Training Component took place at four different park and recreation facilities after the pre-tests were completed. Food safety sanitation students from a nearby university implemented the Food Safety Training Component. These students were all juniors or sophomores in a culinary or hospitality major at a local University, who had taken a Food Service Sanitation class and were certified in food service sanitation. The students were all in their early twenties and have similar grade point averages. Additionally, the students who gave the instruction were Latino, Indian, Jamaican, and Caucasian. A Certified Instructor in Food Service Sanitation trained the trainers on a sixty minute per session, four week component. The sixty minute per session, four week component was chosen for the completion of the pre and post-tests and for the delivery of the four main points to be discussed.

Due to the park and recreation schedules; including holiday "breaks", previously scheduled activities, arrival and departure of children to and from the parks, and homework periods at each site, it was determined that a

sixty minute, four-day curriculum could be implemented in a analogous manner at all four parks.

As a group, the trainers developed and practiced the delivery of the Food Safety Training Component for each of the days and received feedback from the Trainer of the Trainees, the researcher. As previously noted, in order to bring about change in attitude and behavior, some form of "experiential" training must take place in order to have a significant impact on the children in the study (Cohen & Bradley, 1977). It is for this reason that participatory activities were incorporated into the training for the children. Parks had various attendance: Park one: eleven children, Park two: eleven children, Park three: nine children, and Park four: twenty-one children.

Day one included an introduction after the pre-test was given. A brief explanation of the components within the Food Safety Training Component for each day to include: (a) clean and wash fruits, vegetables, and hands, (b) preventing cross-contamination (c) cooking to the correct temperatures, and (d) cooling and thawing properly. Overheads, handouts, and crayons were provided for all trainers to use with the children so that the Park and recreation facilities had the same information and delivery supplies. All trainers used the same type of activity and

participation game to solidify the message and information being delivered.

On the second day of the Food Safety Training Component, the instructors demonstrated proper hand washing using a powder representing bacteria. Hand washing then took place and a black light was used to illuminate the "bacteria" (special powder) still present on the childrens hands, fingers, under nails, and on clothing. Cross Contamination was discussed and a game using Velcro™ on tennis balls in which the children pass along the ball from one another to see who could move the ball down a row of four people the fastest was used. Informative handouts that emphasized food safety were distributed for students to color and take home.

Day three dealt mainly with the handling of fruits and vegetables or food products that receive no additional cooking also known as "ready to eat foods". A demonstration/participation activity for day three was washing melons and the safe method of cutting the fruit. Proper procedures for thawing foods and correct temperatures to cook foods were presented. The activity was for students to match correct temperatures with appropriate food products. At the end of class a short

question/answer game was used to reinforce the information covered for the day.

Day four was a review of the major points of the Food Safety Component with emphasis on (a) clean and wash fruits, vegetables, and hands, (b) preventing cross-contamination (c) cooking to the correct temperatures, and (d) cooling and thawing properly. Students were re-administered the test (the post-test) at the end of the class with 25 minutes remaining. The Food Safety Training Component instructors administered and collected the tests and answer sheets. The parents were also given the same test after the Food safety Training Component was administered in a similar format as the pre-test.

Chapter Four

Analysis of Data

The mean and standard deviation of pre-test and post-test scores for both test groups (children and parents) and for both knowledge and behavior/attitude scores were calculated. Refer to Table 1 & Table 2.

Children's Knowledge Score

To determine if there was a significant difference in the pre-test and post-test scores of the children's knowledge score, a one-way paired *t* test was used. Alpha was set at $p<.05$ level. Figure 1 represents the Bar Graph showing the means for the children knowledge tests.

Children's Attitude/Behavior Score

To determine if there was a significant difference in the pre-test and post-test scores of the children's attitude/behavior score, a one-way paired *t* test was used. Alpha was set at $p<.05$ level. Figure 2 represents the Bar Graph showing the means for the children behavior/attitude tests.

Children's Health Score

To determine if there was a significant difference in the pre-test and post-test scores of the children's health score, a one-way paired *t* test was used. Alpha was set at

Table 1: Children Pre-Test and Post-Test Scores

Children

	Pre-Test		**Post-Test**		**D**	**t**
	X	*SD*	X	*SD*		
Knowledge	31.1	*9.8*	42.7	*11.1*	11.6	-.49***
Behavior/ Attitude	5.78	*2.51*	6.59	*2.59*	.81	-.2076*
Health	4.8	*2.8*	4.5	*2.3*	-.3	.5555NS

Table 1

*** p < .05**
**** P < .01**
***** P < .001**

Table 2: Parent Pre-Test and Post-Test Scores

Parents

	Pre-Test		**Post-Test**		**D**	**t**
	X	*SD*	X	*SD*		
Knowledge	49.8	*14.5*	51.9	*17.0*	2.1	.7509 NS
Behavior/ Attitude	7.35	*2.1*	7.65	*2.4*	.3	-.5048 NS
Health	7.75	*1.9*	7.4	*1.8*	-.35	-1.0848NS

Table 2

*** p < .05**
**** P < .01**
***** P < .001**

Figure 1: Graph Representing Childrens' Knowledge Scores

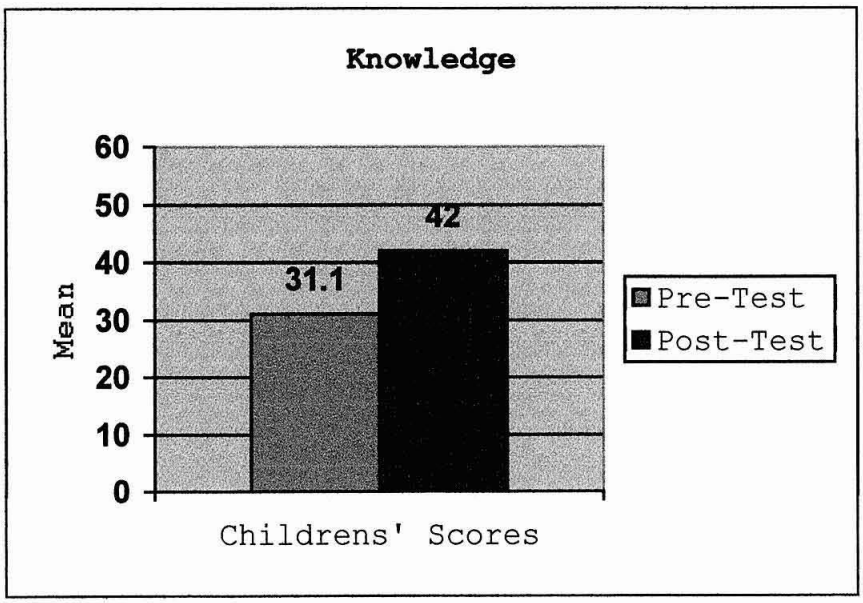
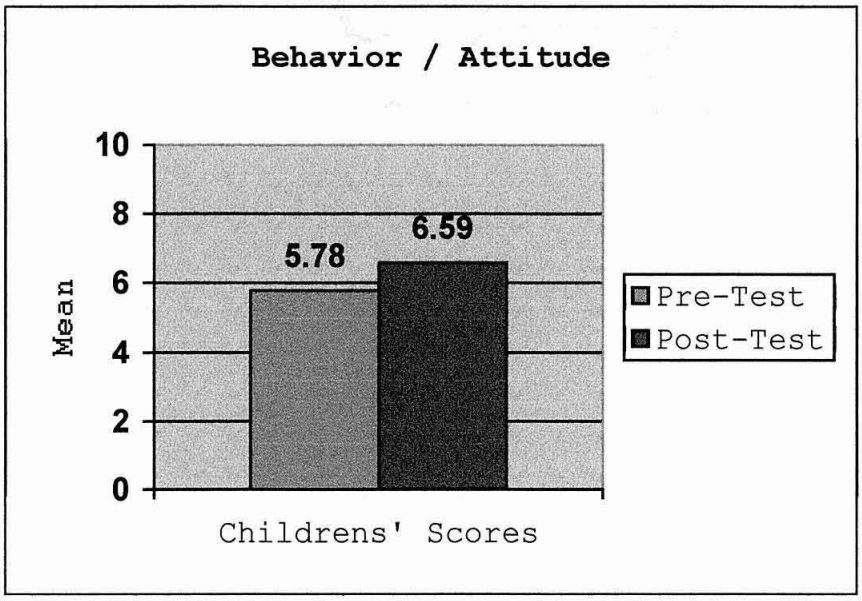


Figure 2: Graph Representing Childrens' Behavior/Attitude Scores



the p<. 05 level. Figure 3 represents the Bar Graph showing the means for the children health tests.

Parents' Knowledge Score

To determine if there was a significant difference in the pre-test and post-test of the parents' knowledge score, a one-way paired *t* test was used. Alpha was set at p<. 05 level. Figure 4 represents the Bar Graph showing the means for the parent knowledge tests.

Parents' Attitude/Behavior Score

To determine if there is a significant difference in the pre-test and post-test of the parents' attitude/behavior score, a one-way paired *t* test was used. Alpha was set at p<. 05 level. Figure 5 represents the Bar Graph showing the means for the parents' behavior/attitude tests.

Parents' Health Score

To determine if there was a significant difference in the pre-test and post-test of the parents' health score, a one-way paired *t* test was used. Alpha was set at the p<. 05 level. Figure 6 represents the Bar Graph showing the means for the parents' health tests.

Research Question #1

In order to test Research Question #1, which states: "Does a Food Safety Training Component for children

Figure 3: Graph Representing Childrens' Health Scores

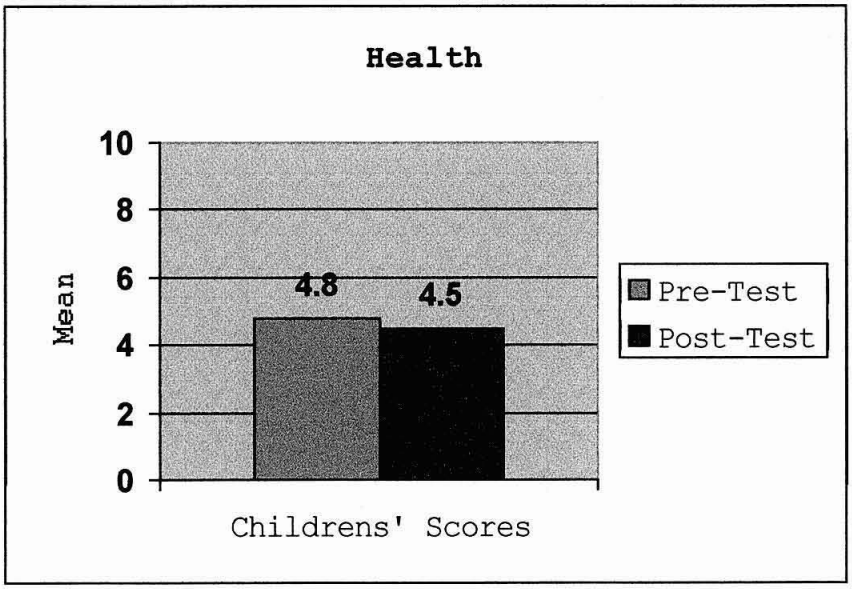


Figure 4: Graph Representing Parents' Knowledge Scores

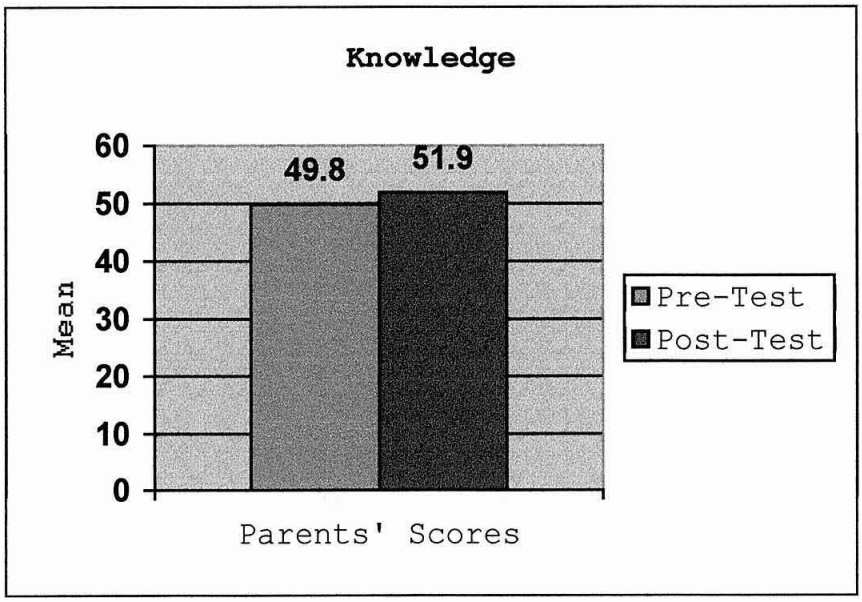


Figure 5: Graph Representing Parents' Behavior/Attitude Scores

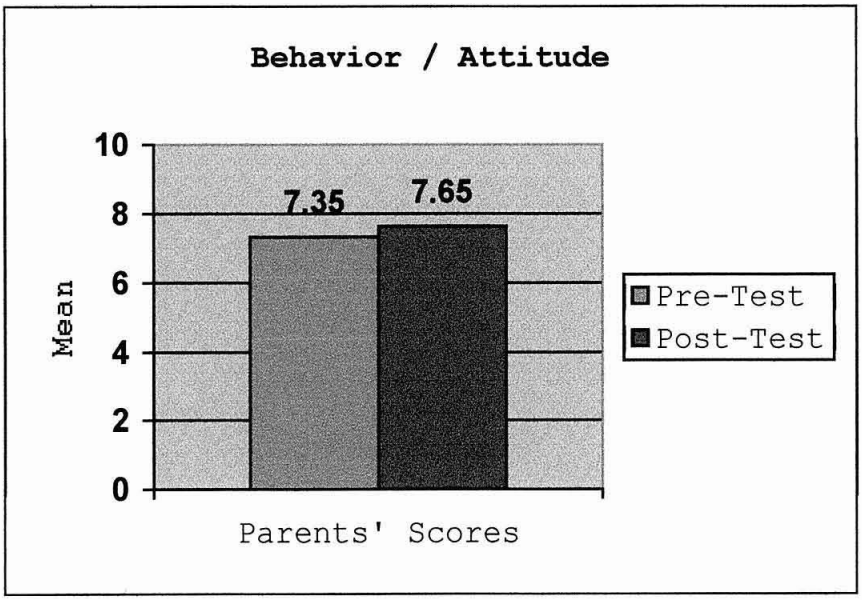
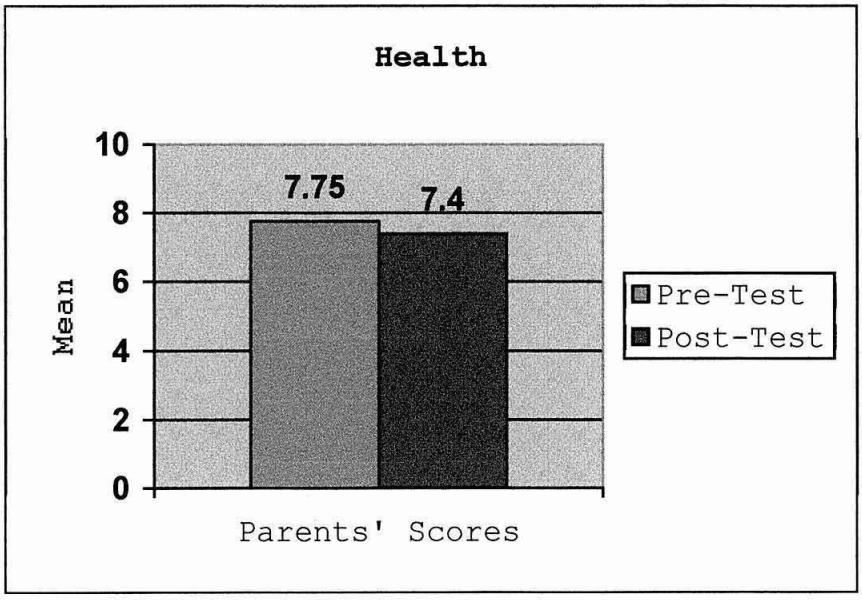


Figure 6: Graph Representing Parents' Health Scores



significantly improve their knowledge of safe food handling?" a one-tailed paired *t*-test was used. The mean for the children's pre-knowledge score was 31.1 with a standard deviation of 9.8 compared to a post knowledge score mean of 42.7 with a standard deviation of 11.1, and a *t* of -5.49 with significance at $p < .001$.

Research Question #2

To test the Research Question #2, which states: "Does a Food Safety Training Component for children significantly improve their behavior/attitude of safe food handling?" a one-tailed paired *t* test was used. The mean for the children pre-behavior/attitude score was 5.78 with a standard deviation of 2.51 compared to a post behavior/attitude mean score of 6.59 with a standard deviation of 2.59, and a *t* of -2.2076 with significance at $p < .05$.

Research Question #3

To test Research Question #3, which states: "Does a Food Safety Training Component for children significantly improve their health score?" a one-tailed paired *t*-test was used. The mean for the children pre-health score was 4.8 with a standard deviation of 2.5 compared to a post health mean score of 4.5 with a standard deviation of 2.3, and a *t* of .5555 with non-significance.

Research Question #4

To test Research Question #4, which states: "Does a Food Safety Training Component for children significantly improve knowledge of safe food handling in their parents?" a one-tailed paired *t* test was used. The mean for the parent pre-knowledge score was 49.8 with a standard deviation of 14.5 compared to a post knowledge mean score of 51.9 with a standard deviation of 17.0, and a *t* of .7509 with non-significance.

Research Question #5

To test the Research Question #5, which states: "Does a Food Safety Training Component for children significantly improve their parents' behavior/attitude of safe food handling?" a one-tailed paired *t* test was used. The mean for the parent pre-behavior/attitude score was 7.35 with a standard deviation of 2.1 compared to a mean post behavior/attitude score of 7.65 with a standard deviation of 2.4, and a *t* of -.5048 with non-significance.

Research Question #6

To test the Research Question #6, which states: "Does a Food Safety Training Component for children significantly improve their parents' health score?" a one-tailed paired *t* test was used. The mean for the parent pre-health score was 7.75 with a standard deviation of 1.9 compared to a

mean post health score of 7.4 with a standard deviation of 1.8, and a *t* of -1.0848 with non-significance.

Discussion

The results of data analysis suggest the children knowledge scores from pre to post are highly significant (p=.00000167) which is understandable since the training assisted the children's ability to improve their scores. However, in contrast, their parents did not increase their knowledge with significance although they scored higher on the test than their children. This could suggest the parents are not teaching their children all they know or think they know in terms of food handling procedures. Behavior/attitude scores for the children from pre to post also had significance (p=.0169), but, again, the parent pre to post did not.

Research Question #1

Research Question #1: Does a Food Safety Training Component for children significantly improve their knowledge of safe food handling? Post-tests are higher on the average as can easily be seen in Figure 1. A *t* test analysis of the childrens' knowledge scores reported in Table 1 shows the means, standard deviations, and a *t* value of -5.49 which is very significant indicating that the difference is greater than by chance. A quantifiable

positive outcome indicates a successful Food Safety Training Program and can be used to support future program development in schools.

However, the children's parents seem to know more than their children do about safe food habits (See Figure 1 & 2). Perhaps the parents need to teach their children more about food preparation giving them the "why" things are done and for what reasons. Basic food safety training provides understanding of simple precautions, steps, and procedures that may assist in the reduction of foodborne illness for the children, their parents, and others with whom they come in contact.

Although there is a mean difference in the right direction with significance for the children's score, their post test score for knowledge is still lower than their parents' pre-test score on knowledge as can be seen in Figure 7 & 8. This could be simply because of the parents' age and experience.

Research Question #2

Research Question #2: Does a Food Safety Training Component for children significantly improve their behavior/attitude of safe food handling? Post-tests are higher on the average as can easily be seen in Figure 2. A

Figure 7: Graph Representing Pre-Test Knowledge Scores

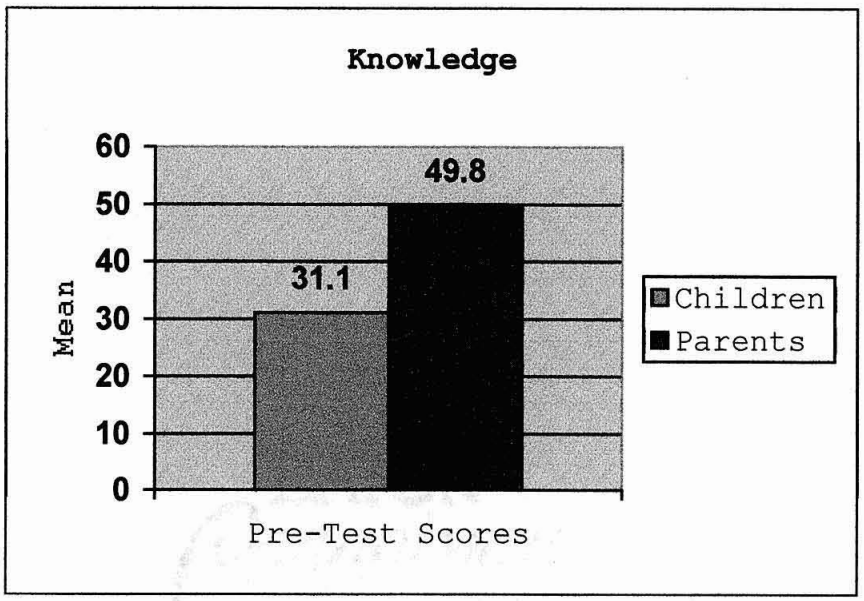
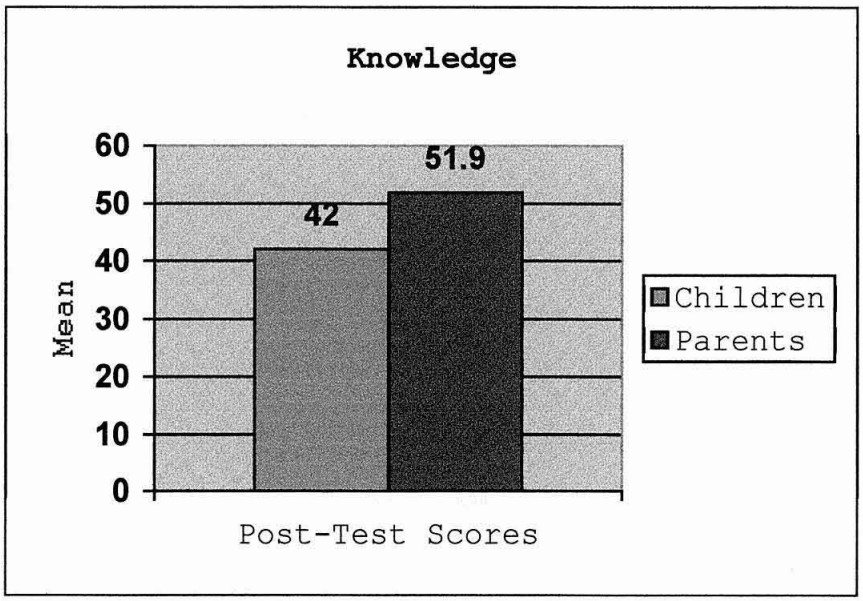


Figure 8: Graph Representing Post-Test Knowledge Scores



t test analysis on the children behavior/attitude scores reported in Table 1 shows the means, standard deviations and a *t* value of -2.2076 which is significant indicating that the difference is greater than by chance. Once again, the parents scored higher in this area before and after the Food Safety Training Component took place as can be seen in Figure 9 & 10.

These results clearly indicate that parents are deficient when it comes to conveying to their children the attitude and behaviors associated with basic food safety awareness. Parents have the ability to provide their children with the knowledge and the ability to model appropriate behaviors and attitudes that would assist in teaching their children basic food safety steps, yet it is not occurring in the home. This also indicates a need for educational intervention to promote Food Safety in schools.

Research Question #3

Research Question #3: Does a Food Safety Training Component for children significantly improve their health score? Post-tests are lower on the average as can easily be seen in Figure 3. A *t* test analysis of the childrens' health scores reported in Table 1 shows the means, standard deviations and a *t* value of .5555 which is not significant. Both children and parents scores were lower after the

Figure 9: Graph Representing Pre-Test Behavior/Attitude Scores

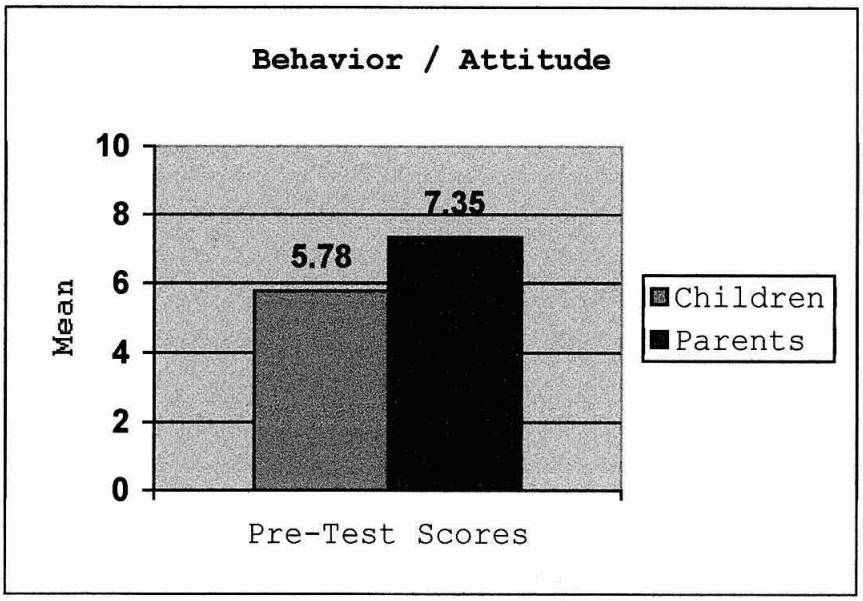
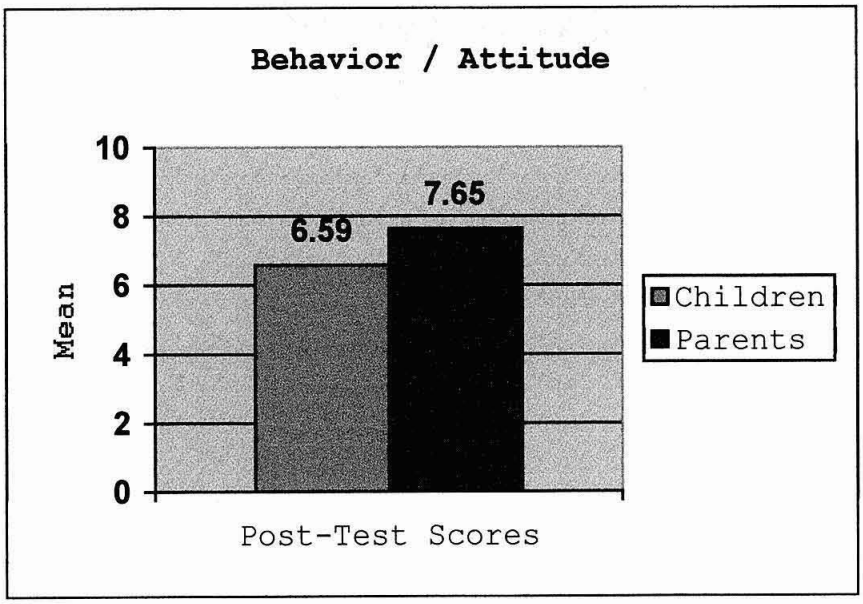


Figure 10: Graph Representing Post-Test Behavior/Attitude Scores



training as can be seen in Figure 11 & 12. The expected outcome was to positively impact learning. This could indicate both child and parent assumptions about food and its ability to cause health problems. Perhaps after the training took place, the children and the parents felt that food and food preparation were responsible for some health concerns. With an improved or refined understanding of food safety, both groups of respondents could have over-analyzed the questions on the health survey. Reading into the data is speculative in such a limited research study. Long-term analysis could clarify the data with more certainty.

Research Question #4

Research Question #4: Does a Food Safety Training Component for children significantly improve knowledge of safe food handling in their parents? The post-tests are higher than the pre-tests but not by a large percentage as can be seen in Figure 4. In fact, Table 2 reports the means, standard deviations, and *t* value of .7509 that is not significant. In this study, the children did not notably improve their parent Knowledge scores at a significant level. Perhaps the length of the training could be increased. In addition, the time interval between pre and post testing might not have allowed for the

Figure 11: Graph Representing Pre-Test Health Scores

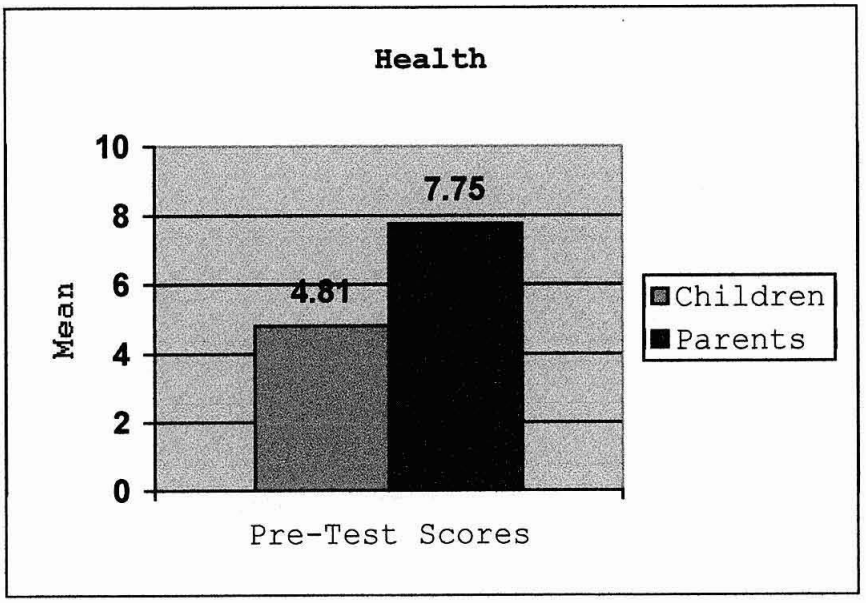
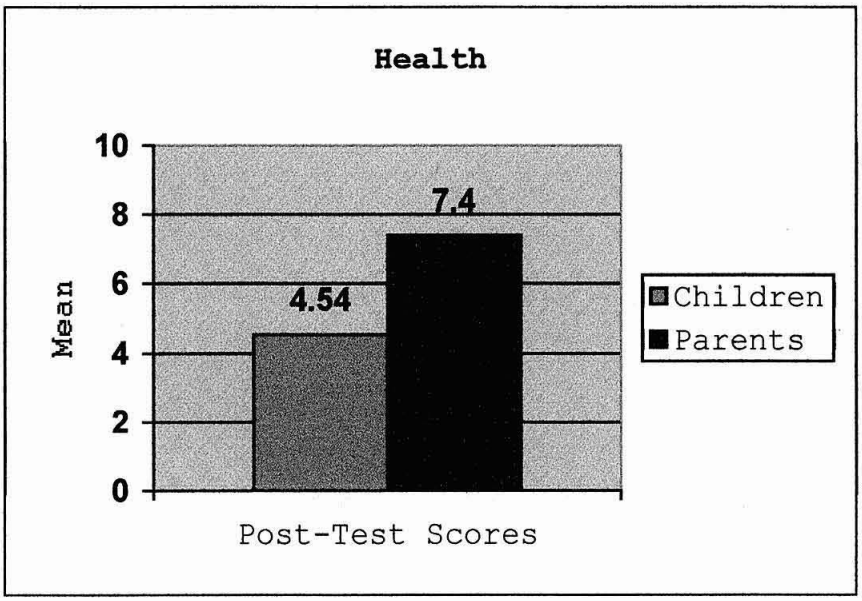


Figure 12: Graph Representing Post-Test Health Scores



children to adequately share the information at home with their parents. Regardless, it is evident that parents require a more effective stimulus to assist with a significant improvement in their Knowledge score.

Research Question #5

Research Question #5: Does a Food Safety Training Component for children significantly improve their parents' behavior/attitude of safe food handling? The post-tests are higher than the pre-tests, but not by a large percentage, as can be seen in Figure 5. In fact, Table 2 reports the means, standard deviations, and *t* value of -.5048 that is not significant. Again, the children did not significantly improve the parent scores in another area, the behavior/attitude score. A more lengthy training of the children could improve the posttest scores; however, it is apparent that parental involvement is limited. Perhaps a more effective approach would be to incorporate a dual Food Safety Training Component for both children and parents. The development of a curriculum with "take-home" assignments to complete with their parents may be all that is necessary. Collaborative tasks where the child works with their parent sharing the information covered in the food safety training, and engaging in related tasks could solidify the message intended for both parties.

Research Question #6

Research Question #6: Does a Food Safety Training Component for children significantly improve their parents' health score? Post-tests are lower on the average as can easily be seen in Figure 6. A *t* test analysis on the parent health scores reported in Table 2 shows the means, standard deviations and a *t* value of -1.0848 which is not significant. In the health test parents scored lower on the post-test as did their children. A longer Food Safety Training Component may have an impact on the data, however it is possible that both children and parents became more aware of possible food-related discomfort or illness. In fact, it is possible for both children and parents to have assumed an illness was food-related when in fact other factors may have been present.

This study clearly indicates that if the public school system were to implement some form of food safety training to children, it would make a significant difference in their knowledge and behavior/attitude concerning food-handling procedures. Indeed, the data suggest that with the contact and the resources, food safety training can be an effective tool to assist in the reduction of avoidable illness related to poor food-handling knowledge and/or behavior or attitude towards food preparation and handling.

Jussaume & Higgins (1998) found that factors that may influence a person's behavior and/or attitudes toward Food Safety include educational background.

The present study on the effects of a Food Safety Training Component on fourth graders and their parents demonstrates a need for this training or a similar type of training on food safety for children. Additionally, research has indicated that strategies aimed at reducing food-related illness should reduce the prevalence of behaviors associated with foodborne diseases, increase consumers' awareness of risks from foodborne illness, and motivate them to change high risk behavior (Yang et al., 1998). The data from this study indicate the ability of a brief Food Safety Training Component to have a positive impact on the knowledge and behavior/attitude of children in regard to Food Safety.

The National Environmental Health Association Position on Children's Environmental Health (1997) recommends to provide parents with basic information so they can take individual responsibility for protecting their children and to expand educational efforts with health and environmental professionals to identify, prevent, and reduce environmental health threats to children. The data in this study clearly identifies gaps

from parent to child in regard to knowledge and behavior/attitude of Food Safety. It would be to the advantage of all parties to narrow these informational and behavioral gaps. Instituting a Food Safety initiative for both children and their parents would assist in the National Environmental Health Associations recommendations, not to mention other possible effects such as reduced medical costs, a reduction in absences, lost wages, and higher grades.

Indeed, this study also demonstrates that the parents' knowledge and behavior/attitude in regard to Food Safety has very little impact on their children's knowledge and behavior/attitude. This reinforces the need for some type of education to take place for children with an emphasis on "safe" food handling procedures. It has been determined that if parents understand the information and have good behavior/attitude towards Safe Food handling, the children are not consciously or unconsciously learning it from them.

Post Hock Analysis

Interesting is the Post Hock analysis of children scores to parent scores for all categories in both (pre) and (post) data using *t*-tests, unmatched assuming unequal variances. All scores for child to parent for both (pre)

and (post) come out significant except for health (post), as can be seen in Tables 3 & 4.

Knowledge Score

For the knowledge test (pre), the parents scored higher on the average as can easily be seen in Figure 7. A *t*-test analysis on the children and parent pre-knowledge scores reported in Table 3 shows the means, standard deviations, and a *t* value of -5.1426, which is very significant and indicates that the difference is greater than by chance. For the knowledge test (post), the parents also scored higher on the average, as can easily be verified in Figure 8. A *t*-test analysis on the children and parent post-knowledge scores reported in Table 4 exhibits the means, standard deviations, and a *t* value of -2.344, which is very significant and indicates that the difference is greater than by chance.

Behavior/Attitude Score

For the behavior/attitude test (pre), the parents scored higher on the average as can easily be seen in Figure 9. A *t* test analysis on the children and parent pre-behavior/attitude scores reported in Table 3 shows the means, standard deviations, and a *t* value of -2.4628, which is highly significant. For the behavior/attitude test (post), the parents scored higher on the average, as can

Table 3: Children and Parent Pre-Test Scores

Pre-Test

	Children		**Parents**		**D**	**t**
	X	*SD*	X	*SD*		
Knowledge	31.1	*9.8*	49.8	*14.5*	18.7	-.1426***
Behavior/ Attitude	5.78	*2.51*	7.35	*2.1*	1.57	-.4628***
Health	4.8	*2.8*	7.75	*1.9*	2.95	-.6069***

Table 3

*** p < .05**
**** P < .01**
***** P < .001**

Table 4: Children and Parent Post-Test Scores

Post-Test

	Children		**Parents**		**D**	**t**
	X	*SD*	X	*SD*		
Knowledge	42.7	*11.1*	51.9	*17.0*	9.2	-2.344*
Behavior/ Attitude	6.59	*2.59*	7.65	*24*	1.06	-.5137***
Health	4.5	*2.3*	7.4	*1.8*	2.9	-5.0075NS

Table 4

*** p < .05**
**** P < .01**
***** P < .001**

easily be seen in Figure 10. A *t* test analysis on the children and parent post-behavior/attitude scores reported in Table 4 shows the means, standard deviations, and a *t* value of -1.5137, which is very significant and indicates that the difference is greater than by chance.

Health Score

For the health test (pre), the parents scored higher on the average, as read in Figure 11. A *t* test analysis on the children and parent pre-health scores reported in Table 3 shows the means, standard deviations, and a *t* value of -4.6069, which is very significant and indicates that the difference is greater than by chance. For the health test (post), the parents scored higher on the average, as can easily be seen in Figure 12. A *t*-test analysis on the children and parent post-health scores reported in Table 4 shows the means, standard deviations, and a *t* value of -5.0075, which is not significant.

The results of this data make the researcher question the impact the Food Safety Training Component had on the parents of the children. Perhaps the parents scored so high on both the knowledge and behavior/attitude pre-tests that it was impossible to score higher on the post-tests? This doesn't seem likely, as the mean score for the parents after the Food Safety Training Component was implemented

remained 51.9. This is far from a passing score, although a higher score in respect to the children. Another possibility is that children are not significantly influencing their parents in this area. Could it be their parents do not take their suggestions, comments, or statements of fact, seriously because they are only "children"? The most interesting fact is that the parents don't seem to influence their own children in the area of food safety knowledge and behavior/attitude.

Chapter Five

Summary/Conclusion

Summary of Findings

The overall purpose of this study was to investigate the outcome of a Food Safety Training Component on both children and their parents. Knowledge can be something that assists in understanding, a difficult parameter to quantify. The real issue is one of changing or improving behavior and attitude in terms of safe food handling procedures. This would provide all parties concerned with a safer set of preventable "habits". If such simple steps as proper temperature control and hand washing are ignored, a higher incidence of illness is the likely result. Understanding works with behavior and attitude. If an individual has the understanding that certain actions or behaviors may increase his/her chance of an unfavorable outcome, perhaps the behavior/attitude will change resulting in a more favorable outcome.

The post-hock analysis identifies some realistic facts that should be noted. It is crucial to educate children in Food Safety because they're not learning it from their parents, according to the data in this research. Knowledge as well as behavior in terms of understanding food safety and the practical application of skills learned should be

addressed for children of all ages. It would also be worthy to design a curriculum for children with parental involvement and participation included. In the long term it may be possible to improve knowledge and behavior/attitude in both child and parent with the same training.

Given the results of this study on the effects of a Food Safety Training Component on fourth graders and their parents, it is clear that information with regard to food safety and/or "safe" food-handling does not automatically transfer from parent to child. These results give justification for need for this type of education to be implemented in the U.S. school system.

Conclusion

Children need to learn about safe food handling procedures for the purpose of maintaining their health now and in the future. Basic fundamental knowledge in terms of healthy eating habits and healthy food handling procedures should not be a random outcome of the public school system in the United States or any country. International boundaries have no meaning to bacteria and the harmful effects they can potentially contribute to almost any food product. Food safety is an issue for all people at all times. When illness can be prevented so simply by teaching

our children how to wash their hands and some simple procedures to follow when thawing food products and preparing food for consumption, there is no logical reason why it should not be taught to all children in the U.S. All children as well as adults need to understand these basic skills. It is imperative for the population to become responsible for their actions, particularly the education of children. Providing food safety education for children would assist in the reduction of food-related illness due to ignorance. Rhode & Sadjimin's study (as cited in Mullan, 1997) suggests that it may be possible for children to act as health promoters in their own homes. Teach the children and with time their parents might learn also.

In conclusion, it is evident that children need some consistent form of training/education in terms of food handling procedures. Parents have some indication of proper technique and acceptable steps when it comes to food handling, yet this knowledge is not shared fully with their children. Additionally, parents do not emphasize the importance of these safe food-handling steps with their children enough to have a significant impact on their behavior/attitude in a positive manner. With increased emphasis on food safety procedures, both children and

parents may take the necessary precautions and safe steps when handling food products for consumption.

Recommendation

It is, therefore, recommended, to study children of all ages in regard to food safety knowledge and behavior/attitude in terms of food handling procedures since older elementary children and middle school students may be lacking in information and skills associated with Food Safety. Additionally, it would be advantageous to understand the impact and outcomes of a continuous food safety training initiative on both the children and their parents in terms of knowledge gained and behavior/attitude change. It would benefit all concerned if an individual took the appropriate steps to minimize or prevent contamination that may lead to an illness. The prevention of a food-related illness impacts a child or parent in many ways. The benefits are numerous and outweigh the cost of such an educational initiative. The positive aspect of such a basic necessity is the elimination of numerous citizens without basic understanding when it comes to the importance of hygiene, and specific food handling procedures; information all people should have acquired after completing the public education system.

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Appendix A: Student Participation/Consent Letter

TODD W. TONOVA
December 3, 2000

Dear Student:

This form is for your signed consent to participate in the Food Safety education that will take place at your local Park or Club. The Food Safety training will enable you to make wise choices when eating or preparing foods. The training will also help to eliminate preventable food related illness.

The Food Safety Education classes will cover basic information that is easy to remember and will not require additional out of class work. It is important to have your willingness and interest.

Thank you for your participation.

Your Signature_____

Appendix B: Parent Participation/Consent Letter

TODD W. TONOVA

June 13, 2001

Dear Parent:

This letter is about the Food Safety Education classes and survey that I would like to administer and my sanitation student's deliver to your child during the month of December and January (exact date to be determined). Food safety is an important issue for our children, but no mandated education exists in the public school system to teach kids about food safety and proper food handling.

The children participants will learn about food safety and proper food handling procedures. This will include hand washing, time and temperature control, cross contamination, proper food storage, and the types of potentially hazardous foods. To administer the study, I need the parents to fill out a short questionnaire before the training takes place (for the children) and shortly thereafter. The children will acquire skills that are important for them and their families.

All in all, I feel this is an important topic and hope this leads to Food Safety Education for all children. I am a father of three girls, an Associate Professor at Johnson & Wales University, Chef Instructor, who teaches Culinary classes in the School of Culinary Education and the academic class Food Safety Sanitation.

Your participation is voluntary. I ask that you fill out the survey now, and again in the future. This will only take about five minutes of your time. Send this form, the survey, and the answer sheet back with your child on the first day of the training.

Your Signature_____

Appendix C: Instrument

FOOD QUESTIONNAIRE

Your honest response to this test will help educate all people and reduce unnecessary illness.

Please take five minutes to complete. Fill in answers with a #2 pencil.

Return both the questionnaire and your answer sheet.

THANK YOU!

1. Is there a meat thermometer in your kitchen?
   a) yes
   b) no

2. If you own a meat thermometer do you use it when cooking roasts, ground beef or chicken?
   a) sometimes
   b) always
   c) never

3. When re-heating a food item in the microwave, what is the proper temperature to kill off all bacteria?
   a) 140 degrees
   b) 150 degrees
   c) 165 degrees
   d) 135 degrees

4. When cleaning your workstation, what would be acceptable?
   a) Windex
   b) Water
   c) Warm water and soap
   d) None of the above

5. Where in the kitchen should you defrost/thaw meat, poultry, or fish?
   a) Kitchen counter
   b) Top shelf of refrigerator
   c) In the oven
   d) Bottom shelf of refrigerator

6. Do you use a fruit or vegetable anti-bacterial spray in your kitchen?
   a) yes
   b) no

7. After washing hands, dry hands with…
   a) A dish rag
   b) Pants
   c) A single use paper towel
   d) A used paper towel

8. Before preparing food, how long should you wash (with soap) your hands?
   a) 30 seconds
   b) 10 seconds
   c) 5 seconds
   d) 20 seconds

9. While cooking, you sneeze and blow your nose, when returning…
   a) continue cooking
   b) rinse your hands

c) wash your hands
d) none of the above

10. When defrosting raw meat…
    a) leave it in the refrigerator overnight
    b) run it under warm water
    c) leave it out on the counter over night
    d) run it under cool water

11. When putting away leftover foods…
    a) put it directly in the refrigerator (same cooking container)
    b) put it in a shallow dish and then refrigerate
    c) let it sit out until it cools
    d) throw it away

12. After dropping a spatula on the floor…
    a) wipe it off
    b) put it back on the counter
    c) rinse it off
    d) wash it

13. When you cook chicken…
    a) check with your finger to see if it's done
    b) poke it with a fork to see if the juices are clear
    c) use a knife and fork to cut it open to check for doneness
    d) use a thermometer to ensure a minimum 165 degrees
    e) none of the above

14. When thawing meat in the refrigerator…
    a) place it anywhere
    b) put it on the top shelf
    c) place it next to other ingredients for the meal
    d) place it on the bottom shelf with a plate on platter to catch drippings

15. You have just cut some meat on a cutting board and need to use it for cutting fruit, do you?
    a) go ahead and cut the fruit
    b) wash your hands and cut the fruit
    c) wash the board, knife, fruit and your hands then cut the fruit

16. In order to sanitize knives or tools, warm soapy water should be followed with a hot (165degrees) water rinse or with a sanitizing solution.
    a) True
    b) False

17. What is the temperature range for bacteria growth?
    a) 150-180 degrees
    b) 40-140 degrees
    c) 32-40 degrees
    d) 140-180 degrees

18. If you have chicken and vegetables to cut, it is important to…
    a) cut the chicken first, wipe off the board and then cut the vegetables
    b) cut vegetables first, wipe off board and cut chicken
    c) cut both items on same board at same time
    d) none of the above

19. How would you handle cutting beef next to fish?

a) cut them together
b) cut them separately on same cutting board
c) cut them separately on clean cutting boards
d) wash knife, board, and hands between cutting

20. When fruit is brought from the grocery store, what should you do before eating?
a) Wipe b) rinse c) eat d) wash thoroughly

21. Which of the following people are considered high risk for food related illness?
a) pregnant women
b) elderly
c) infants
d) all of the above

22. When you cook meals at home, do you:
a) cook it until it's done
b) check with a thermometer to ensure proper minimum temperatures
c) use the time it is in the oven to determine doneness
d) none of the above

23. Before allowing kids to eat fruit and vegetables, you should...
a) have them wash their hands
b) wash fruit or vegetables
c) all of the above
d) none of the above

24. When cooking vegetables such as potatoes or broccoli...
a) wash your hands first
b) cook the vegetables without washing
c) wash the vegetables before cooking
d) a and b
e) a and c

25. What is the temperature range for harmful bacterial growth on food products?
a) 0-40 degrees
b) 40-140 degrees
c) 140-200 degrees
d) 200-350 degrees

26. Which of the following does not need to be washed before it is eaten?
a) apples
b) corn
c) lettuce
d) watermelon
e) all of these should be washed

27. How often do you wash your hands?
a) before every meal
b) before preparing a meal
c) after a meal
d) all of the above

28. After preparing chicken...
a) wipe counter and cutting board off with water and a towel
b) clean preparation area with soap and warm water
c) glance at the preparation area to see if it looks clean enough not to sanitize

d) none of the above

29. When preparing a salad, do you?
    a) wash everything and prepare together
    b) prepare everything separate
    c) wash only the lettuce
    d) don't wash anything

30. Raw meats should never come in contact with other foods because of...
    a) dirt
    b) other foods may contaminate the raw food product
    c) flavor may be lost
    d) the raw meat may contaminate the food products
    e) none of the above

31. Is Food Safety something that is important to you and your family?
    a) not really
    b) no
    c) sometimes, especially when we go out to eat
    d) yes, definitely, all the time at home and out

32. Ensuring something is cooked to a safe temperature as mentioned on packaging is:
    a) never looked at
    b) sometimes looked at
    c) always followed to the recommended temperature
    d) looked at and not followed

33. Do you think Food Safety should be taught in the school system?
    a) in some classes, but not all
    b) no, it's not that important
    c) yes, definitely for all children
    d) it already is

34. Is food preparation and food handling procedures important in your home?
    a) sometimes, especially around the holidays
    b) No, never
    c) Yes, always
    d) It depends on how I feel that day

35. When preparing meals with raw chicken or turkey, how careful are you with knives, cutting boards, and work surfaces?
    a) very careful, washing after using any utensils, knives, and counters
    b) don't really pay attention
    c) wipe everything off with a dry towel to keep everything neat and clean
    d) since the product comes from the store it's safe to handle without too much care

36. When thawing foods it is:
    a) important where and how it gets thawed
    b) not important how but where is very important
    c) important to thaw it quickly
    d) not important where or how

37. Proper cooking temperatures are:
    a) not important
    b) basic knowledge passes down from generation to generation
    c) very important and I'd like to know more

d) simple and need no explanation

38. When cooking meats or food products with egg in it such as meatloaf, do you ensure:
    a) the product is cooked very well done
    b) the food product is cooked well and checked with a thermometer
    c) the product is browned and cooked until firm
    d) not worried about the final cooking temperature

39. In terms of health, do you feel there is a connection between food preparation procedures and illness?
    a) No, not really
    b) yes
    c) It's possible
    d) Occasionally

40. Is food preparation an important component in the health of your family?
    a) Only when we go out
    b) Never
    c) More and more I am beginning to feel so
    d) always have, always will

41. In the last month, how many times have you had stomach cramps or abdominal pain without reason?
    a) 1-3 times
    b) 4-6 times
    c) More than 6 times
    d) None

42. In the last month have you experienced any fever, nausea or vomiting?
    a) 1-3 times
    b) 4-6 times
    c) More than 6 times
    d) None

43. In the last 30 days have you experienced any discomfort associated with food products?
    a) 1-3 times
    b) 4-6 times
    c) More than 6 times
    d) None

44. Has any one in your family recently experienced the flu?
    a) Yes
    b) No

45. In the past month, how many times have you or your family gone out to eat at a restaurant?
    a) 1-3 times
    b) 4-6 times
    c) More than 6 times
    d) None

46. When going out to eat, are you particularly concerned about the way your food is being handled and prepared?
    a) Yes, definitely
    b) No, not really
    c) Confident in the establishment
    d) Do not give it much thought

47. When eating at home are you concerned how you prepare certain food items?

a) Yes, definitely
b) No, not really
c) Confident in the establishment
d) Don't give it much thought

48. In the last month have you experienced stomach pains after eating leftovers?
    a) 1-3 times
    b) 4-6 times
    c) More than 6 times
    d) None

49. When shopping, are expiration dates of importance?
    a) Yes, definitely
    b) Sometimes
    c) Never
    d) Only for eggs and milk

50. In the last month have you experienced any ill feelings associated with foods from your public schools lunch program?
    a) 1-3 times
    b) 4-6 times
    c.) More than 6 times
    d) None

Appendix D: Food Safety Component Agenda

Day One:

- Administer test collect all materials.
- Explanation of the components within the Food Safety Training Component for each day to include:
  (1) clean and wash fruits, vegetables and hands
  (2) preventing cross-contamination
  (3) cooking to the correct temperatures
  (4) cooling and thawing properly

- Use overhead transparencies for the Four main points explaining what each means in lecture.
- Activity: Pass out "Fight Bac" coloring sheet and crayons. While children are coloring explain Bacteria as a living organism present in daily life. Emphasize the ability of bacteria to grow to unsafe numbers on food products if left out at certain temperatures.
- Explain the Temperature Danger Zone 40-140 degrees to the children.

Day Two:

- Demonstrate proper hand washing using water as hot as one can manage. The use of soap, lathering for at least twenty seconds (sing the Happy Birthday Song).

Rinse and dry using a single use paper towel or new hand towel.

- Explain importance of not getting hands contaminated with other bacteria present in soil, on food products etc. especially raw products.
- Use the glow-powder representing bacteria and black light to solidify activity.
- Play the Cross Contamination game using Velcro™ tennis balls.
- Pass out coloring handout for children to complete and take home.

Day Three:

- Explain handling of fruits and vegetables or food products that receive no additional cooking also known as "ready to eat foods".
- Demonstration/participation activity: washing melons and the safe method of cutting the fruit.
- Proper procedures for thawing foods and correct temperatures to cook foods (poultry-165, beef-145, pork-145, fish-145, eggs-145, "leftovers"-165, and any ground meat product-165.
- Activity- Play matching game (correct temperatures with appropriate food products).

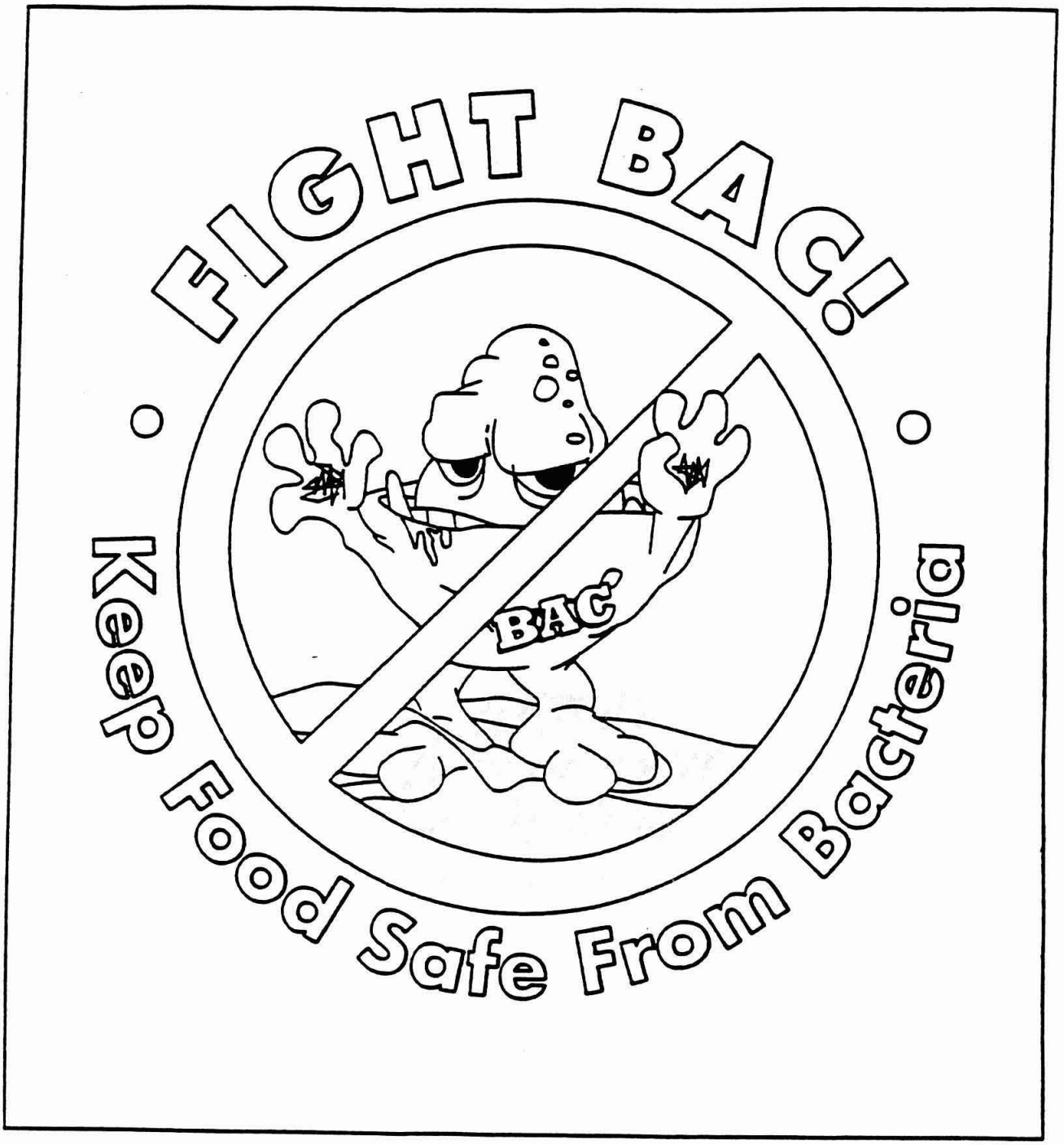
- Question/answer items covered.

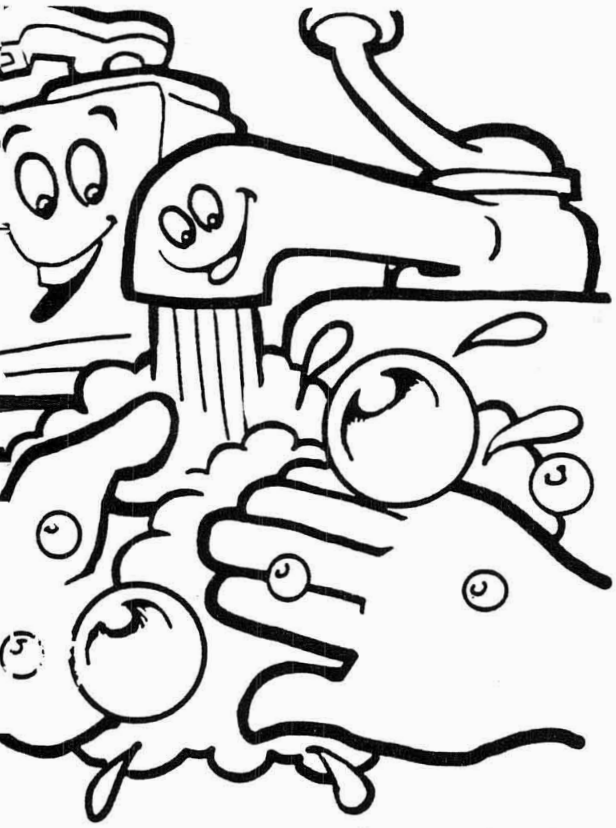
Day Four:

- Review the major points of the Food Safety Component with emphasis on:
  (1) clean and wash fruits, vegetables and hands
  (2) preventing cross-contamination
  (3) cooking to the correct temperatures
  (4) cooling and thawing properly

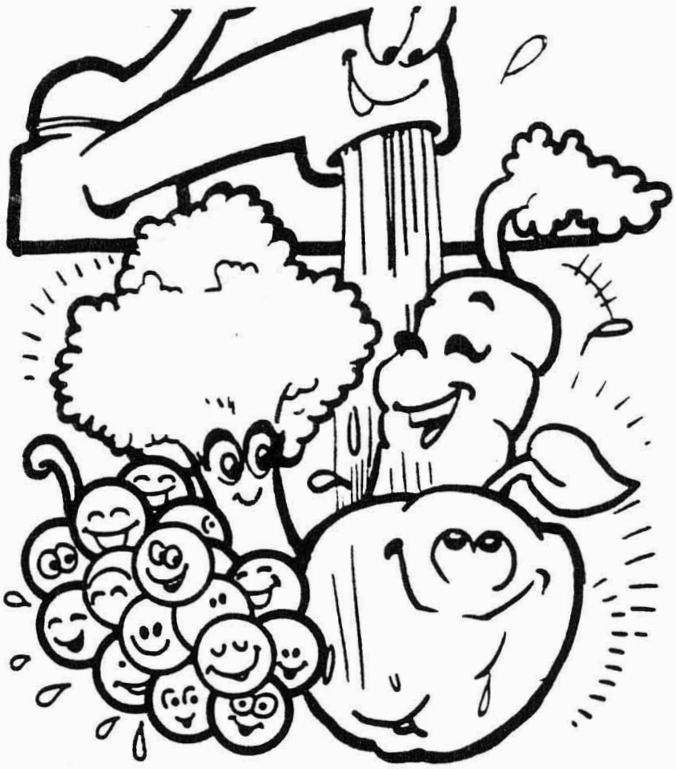
- Administer the test to the children and collect all materials.

This is BAC. He is bad and could make you sick.
Follow the safe food handling rules and stay healthy.

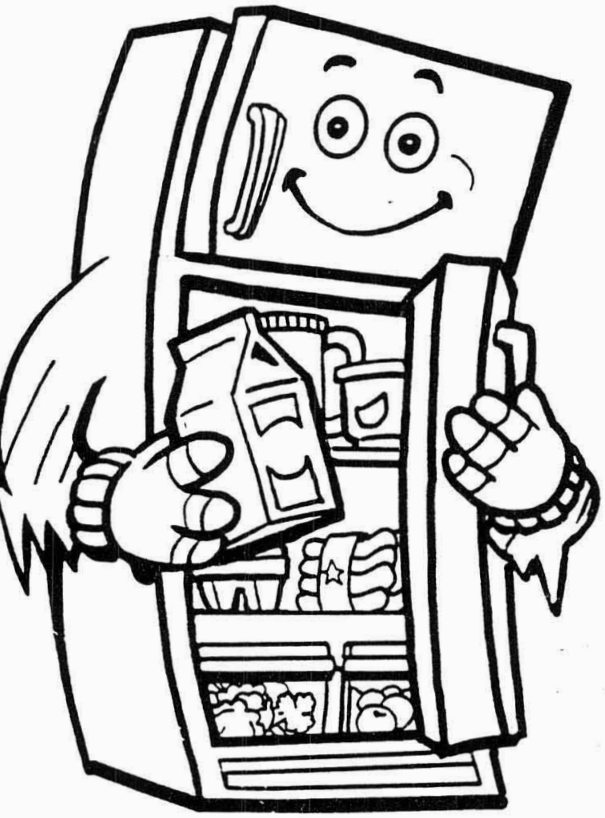




Wash, - wash, - wash, - your hands
With soap - and wa - ter too



Rinse - your fruits - and vege - tables
and make - them clean - for you



Put food - in the - refrig - er - ator
Do - it right - away

Keep count - ers clean - where food - is prepared
And chase - those germs - away